BIOLOGY

Course Structure

Units	Topics	Marks
VI	Reproduction	14
VII	Genetics & Evolution	18
VIII	Biology & Human Welfare	14
IX	Biotechnology & its Applications	10
X	Ecology & Environment	14
	Practical Work	30
Total		**100**

Course Syllabus

Unit VI. Reproduction

Chapter 1: Reproduction in Organisms

- Reproduction:
  - A characteristic feature of all organisms for continuation of species
- Modes of Reproduction:
  - Asexual reproduction
  - Sexual reproduction
- Asexual reproduction:
  - Modes-Binary fission
  - Sporulation
  - Budding
  - Gemmule
  - Fragmentation
  - vegetative propagation in plants

Chapter 2: Sexual Reproduction in Flowering Plants

- Flower structure
- Development of male and female gametophytes
- Pollination:
  - Types
  - Agencies
  - Examples
- Outbreeding devices
- Pollen-Pistil interaction
- Double fertilization
- Post fertilization Events-Development of endosperm and embryo
- Development of seed and formation of fruit
- Special modes:
  - Apomixes
  - Parthenocarpy
  - Polyembryony
- Significance of seed and fruit formation

Chapter 3: Human Reproduction

- Male and female reproductive systems
- Microscopic anatomy of testis and ovary
- Gametogenesis:
  - Spermatogenesis
  - Oogenesis
- Menstrual cycle
- Fertilisation embryo development up to blastocyst formation, implantation pregnancy and placenta formation (Elementary idea)
- Parturition (Elementary idea)
- Lactation (Elementary idea)

Chapter 4: Reproductive Health

- Need for reproductive health and prevention of sexually transmitted diseases (STD)
- Birth control:
  - Need and Methods
  - Contraception
  - Medical Termination of Pregnancy (MTP)
- Amniocentesis
- Infertility and assisted reproductive technologies:
  - IVF
  - ZIFT
  - GIFT (Elementary idea for general awareness)

Unit VII. Genetics and Evolution

Chapter 5: Principles of Inheritance and Variation

- Mendelian Inheritance
- Deviations from Mendelism:
  - Incomplete dominance
  - Co-dominance
  - Multiple alleles
  - Inheritance of blood groups
  - Pleiotropy
- Elementary idea of polygenic inheritance
- Chromosome theory of inheritance
- Chromosomes and genes
- Sex determination in:
  - Humans
  - Birds
  - Honey bee

- Linkage and crossing over
- Sex linked inheritance:
  - Haemophilia
  - Colour blindness
- Mendelian disorder in humans
  - Thalassemia
- Chromosomal disorders in humans:
  - Down's syndrome
  - Turner's
  - Klinefelter's syndromes

Chapter 6: Molecular Basis of Inheritance

- Search for genetic material and DNA as genetic material
- Structure of DNA and RNA
- DNA packaging
- DNA replication
- Central dogma
- Transcription, genetic code, translation
- Gene expression and regulation:
  - Lac Operon
- Genome and human ganeome project
- DNA fingerprinting

Chapter 7: Evolution

- Origin of life
- Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence)
- Darwin's contribution
- Modern Synthetic theory of Evolution

- Mechanism of evolution:
    - Variation (Mutation and Recombination)
    - Natural Selection with examples
    - Types of natural selection
- Gene flow and genetic drift
- Hardy - Weinberg's principle
- Adaptive Radiation
- Human evolution

Unit VIII. Biology and Human Welfare

Chapter 8: Human Health and Diseases

- Pathogens - parasites causing human diseases:
    - Malaria
    - Filariasis
    - Ascariasis
    - Typhoid
    - Pneumonia
    - Common cold
    - Amoebiasis
    - Ring worm
- Basic concepts of immunology – Vaccines:
    - Cancer
    - HIV
    - AIDs
- Adolescence, drug and alcohol abuse

Chapter 9: Strategies for Enhancement in Food Production

- Improvement in food production:
    - Plant breeding

- Tissue culture
- Single cell protein
- Biofortification
- Apiculature
- Animal husbandry

Chapter-10: Microbes in Human Welfare

- In household food processing
- Industrial production
- Sewage treatment
- Energy generation and as biocontrol agents
- Biofertilizers
- Antibiotics:
    - Production and judicious use

Unit IX. Biotechnology and Its Applications

Chapter 11: Biotechnology - Principles and Processes

- Genetic engineering (Recombinant DNA technology).

Chapter 12: Biotechnology and its Application

- Application of Biotechnology in health and agriculture:
    - Human insulin and vaccine production, gene therapy
    - Genetically modified organisms - Bt crops
    - Transgenic Animals; biosafety issues, biopiracy and patents

Unit X. Ecology and Environment

Chapter 13: Organisms and Populations

- Organisms and environment:
  - Habitat
  - Niche
  - Population
  - Ecological adaptations
- Population interactions:
  - Mutualism
  - Competition
  - Predation
  - Parasitism
- Population attributes:
  - Growth
  - Birth rate
  - Death rate
  - Age distribution

Chapter 14: Ecosystem

- Patterns
- Components
- Productivity
- Decomposition
- Energy flow
- Pyramids of number, biomass, energy
- Nutrient cycles (carbon and phosphorous)
- Ecological succession
- Ecological services:
  - Carbon fixation

- Pollination
- Seed dispersal
- Oxygen release (in brief)

Chapter-15: Biodiversity and its Conservation

- Concept of biodiversity
- Patterns of biodiversity
- Importance of biodiversity
- Loss of biodiversity
- Biodiversity conservation:
  - Hotspots
  - Endangered organisms
  - Extinction
  - Red data book
  - Biosphere reserves
  - National parks
  - Sanctuaries
  - Ramsar sites

Chapter-16: Environmental Issues

- Air pollution and its control
- Water pollution and its control
- Agrochemicals and their effects
- Solid waste management
- Radioactive waste management
- Greenhouse effect and climate change
- Ozone layer depletion
- Deforestation
- Any one case study as success story addressing environmental issue(s).

Practical Works

Part A: List of Experiments

- Study pollen germination on a slide.
- Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity. Correlate with the kinds of plants found in them.
- Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms.
- Study the presence of suspended particulate matter in air at two widely different sites.
- Study of plant population density by quadrat method.
- Study of plant population frequency by quadrat method.
- Prepare a temporary mount of onion root tip to study mitosis.
- Study the effect of different temperatures and three different pH on the activity of salivary amylase on starch.
- Isolation of DNA from available plant material such as spinach, green pea seeds, papaya, etc.

Part B: Study/observation of the following (Spotting)

- Flowers adapted to pollination by different agencies (wind, insect, bird).
- Pollen germination on stigma through a permanent slide.
- Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper/mice).
- Meiosis in onion bud cell or grasshopper testis through permanent slides.
- T.S. of blastula through permanent slides.
- Mendelian inheritance using seeds of different colour/sizes of any plant.
- Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colour blindness.
- Controlled pollination - emasculation, tagging and bagging.

- Common disease causing organisms like Ascaris, Entamoeba, Plasmodium, Roundworm through permanent slides or specimens. Comment on symptoms of disease that they cause.
- Two plants and two animals (models/virtual images) found in xeric conditions. Comment upon their morphological adaptations.
- Two plants and two animals (models/virtual images) found in aquatic conditions. Comment upon their morphological adaptations.